Revue suisse Zool.	Tome 83	Fasc. 2	p. 307-316	Genève, juin 1976

A new lophodesmid milliped from a Guatemalan cave, with notes on related forms (Polydesmida: Pyrgodesmidae)

by

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With 12 text-figures

SUMMARY

Lophodesmus petrinus, n. sp. is described from Cueva Chirripeck near Coban, Guatemala, and compared with the several species already ascribed to that genus from Central America. The tubercule pattern and genitalia are figured for *L. perparvus* Pocock, and the external appearance of the type species *L. pusillus* Pocock is accounted. It is suggested that the American species will eventually be referred to another genus, and the existing name *Synoptura* (Attems, 1914) is revived to accomodate *Lophodesmus laminatus* Pocock. It is noted that among species which are externally very similar gonopod structure can vary considerably.

A tentative system for nomenclature of the tergal tubercule patterns is suggested as a means of systematizing future descriptions of body form.

During April 1973 the well-known speleobiologist Pierre Strinati obtained zoological material from several caves in Alta Verapaz, Guatemala, which he donated to the Museum d'histoire naturelle de Genève. Through the intervention of Dr. Bernd Hauser, Curator of Arthropods and Lower Insects of that Museum, the samples of Diplopoda taken by Dr. Strinati were transmitted to me for identification.

One of the species, a minute trichopolydesmid, is being treated in another paper along with other new Neotropical taxa of that group. I deal here with an undescribed species referable to *Lophodesmus* in the present, admittedly unsatisfactory, concept of that genus, not that the description of still another small tropical milliped has any merit in itself, but because of the opportunity to present some descriptive notes and commentary on details of the *Lophodesmus*-problem.

Lophodesmus has always presented a frustrating situation in that its type species, *L. pusillus* Pocock from Flores, was described from a female specimen and insofar as I know, no genuine male topotypes have ever been collected. We are therefore still ignorant of what the genitalia characters of *pusillus* are like, and consequently it remains impossible to know if American species described in *Lophodesmus* are correctly placed.

In the hope of casting some light on the difficulty, I obtained on loan the holotypes of *L. pusillus* and two of the Central American « *Lophodesmus* » described by Pocock in 1909, for comparison with the Strinati material. Any aspirations about clarifying the status of the genus were, however, doomed to disappointment as will become evident in the following text.

The type material of Pocock's species was kindly made available to me from the British Museum collections by Mr. Keith H. Hyatt, to whom I am very much indebted. I thank also Dr. Hauser for placing the Strinati collections in my hands, and my colleague Dr. W. A. Shear for information and opinion about Guatemalan lophodesmids.

FAMILY PYRGODESMIDAE

As recently noted by Jeekel (1971) the family name Stylodesmidae was published several months ahead of Silvestri's Pyrgodesmidae but at the time both the family and its type genus *Stylodesmus* were still nomina nuda. *Stylodesmus* was not validated until after the publication of Pyrgodesmidae in early 1896. Since it now appears that both these nominal family names cover the same zoological taxa, Stylodesmidae is regarded as a junior subjective synonym of Pyrgodesmidae.

The extent of this family, and its internal classification, are at the present essentially unknown. Traditional taxonomic practice has assumed generic value for a number of characters (e.g., number of segments, distribution of ozopores, modification of tergal tuberculation) which in the light of recent studies (see especially Shear, 1974) are probably only of specific importance. A large number of both species and genera have been based upon females or males in which gonopod structure was disregarded, and if the example of most other milliped groups is any indication, virtually all of the known pyrgodesmid taxa will have to be restudied as regards gonopod characters before any kind of synthesis can be essayed.

PROPOSED TUBERCULE NOMENCLATURE

The highly diverse patterns of dorsal tubercules and lateral lobes in pyrgodesmids suggests the possibility of some inherent taxonomic value. As an initial step in exploring such an avenue, I suggest here a very provisional and preliminary nomenclature of the more obvious structures in *Lophodesmus*, in the hope it can be examined critically by colleagues having material of other taxa at their disposal.

A common ornamentation amongst pyrgodesmoids is that of four longitudinal rows of enlarged tubercules (usually three in each series) on the metaterga of most body segments. The inner row on each side can be referred to as *paramedian* (PM), the outer as *dorsolateral* (DL), and commencing at the anterior end, each tubercule in the series can be numbered from 1 to 3. Middorsally, between the paramedian series, are usually a number of smaller tubercules, often paired, which can be called *middorsal* (md), and in the space between series PM and DL on each side is another set of small tubercules, again usually paired, for which the name *intercalary* (int) is proposed. In the material at hand, it appears that the detailed arrangement of these various series changes on progressive body segments, and this fact may also be found a useful device in identifying female specimens, or for indicating relationships between species.

The paranota in *Lophodesmus* are relatively small and continue the slope of the dorsum, or flare outward only slightly. Only those of the 2nd segment are laterally expanded, with three marginal lobes. Paranota of nonporiferous segments appear indistinctly bilobed, with prominent anterior and posterior marginal thickenings, referred to here as *lateral paranotal lobes* (LP 1 and LP 2). On the anterior edge there are initially three marginal tubercules between LP 1 and DL 1, these are designated as *anterior marginals* (Am 1, 2, 3). In going posteriorly on the body, these tubercules usually reduce from three to two. The posterior edge initially also has three marginal tubercules, *caudomarginals* (Cm 1, 2, 3), as well as an appreciably larger and thicker lobe evident on all segments from 2 through 19, and here called the *posterior paranotal lobe* (PP).

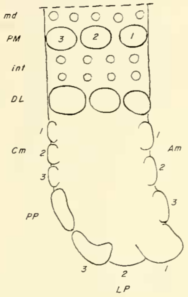


Fig. 1.

Diagrammatic representation of right side of 2nd segment of a lophodesmid milliped to show tergal tubercule series. Broken line represents the middorsal line. Abbreviations: Am, anterior marginal; DL, dorsolateral; Cm, caudomarginal; int, intercalary; LP, lateral paranotal; md, middorsal; PM, paramedian; PP, posterior paranotal. Larger and more persistent series indicated by capital letters.

On poriferous segments 5, 7, 9, 10, 12, 13, 15 and 16, the porostele largely displaces LP 3, but a remnant of it may persist in the space between the porostele and PP.

Ornamentation of the 20th segment is somewhat modified, in that no separate tubercules per se are manifest in series. As shown in figure 8 there are two large middorsal terminal tubercules (T), laterad to which are broader and flattened subterminal lobes (S) and still more proximal, a third lobe (L). Of these, T doubtless corresponds to series PM of the body segments, and S possibly represents series DL, although this cannot be asserted as a true homology.

The accompanying figure (fig. 1) shows the preceeding tubercules and series in a generalized diagram designed to show the maximum complement. Many of them are also labeled on the subsequent drawings of the particular species considered here. In view of the observed sequential changes that take place along the body it seems desireable to select always a midbody segment for species description, unless the entire pattern is to be described. Most of the alterations from the pattern of the anterior segments have taken place by the 10th segment.

TAXONOMY

Present knowledge of the genus *Lophodesmus* is very unsatisfactory. The genus was proposed by Pocock (1894) for a species *(L. pusillus)* from Flores known to him only from a single female specimen which has, apparently, never been restudied by anyone else. Shortly thereafter, J. Carl (1902) described a male of what he considered to be Pocock's species, taken in Java. Obviously such an identification could only be regarded as conjectural, yet it formed the operational concept of *Lophodesmus* for nearly all subsequent workers. As time passed, a variety of Indoaustralian species were named in *Lophodesmus*, but most of them were later referred to other genera, chiefly on the basis of differences in tergal ornamentation (such as the degree of prolongation of the PM tubercules). In 1909, Pocock named some further *Lophodesmus* species from Central America, three in all, of which two seemed closely related to *L. pusillus* at least in outward body form, whilst the third, *L. laminatus*, certainly differed in its much broader and flatter appearance, to say nothing of a much greater size. It was not long until Attems (1914) set up the new genus *Synoptura* for all three of these species, on the basis of a supposed difference in degree of exposure of the 20th segment.

Some additional species from tropical America have appeared in *Lophodesmus*. A West Indian species originally described by Chamberlin (1918) as *Treseolobus caraibianus* has been subsequently transferred by Loomis (1934) into *Lophodesmus*, and the new species *L. brasilianus* (based on a single female from Para) named by Schubart (1945) and *L. bituberculatus* (Puerto Rico) by Loomis (1970).

Lastly, a review of the Middle American genera of pyrgodesmoids, with a consideration of their status and of commonly misused taxonomic characters, has been published by W. A. Shear (1974). In this important and useful work, Dr. Shear made a good start toward clarification of the group, and emphasized the illusory nature of « genera" founded upon purely adaptive external characters.

In this paper, Shear described two new species, *L. italolegatus* and *L. tioticho*, from Guatemalan caves and gave for the first time large clear drawings of the gonopods of millipeds thought to belong to this genus. It is to be hoped that the high standards of Shear's work can be maintained in future studies of pyrgodesmoids.

As he clearly indicated in his remarks on the family generally, it is now manifest that only a complete revision of the entire group can bring any order and system from the existing confusion. I venture however to make a few remarks on the basis of my observations of limited material, which may be useful to whoever eventually takes up the serious study of these small millipeds.

First, it is clear that similarity in external features does not always reflect close relationship as expressed in gonopod structure. It is easy to see that *L. italolegatus*, *L. tioticho*, and *L. petrinus* are basically alike in terms of male genitalia and comprise a natural group, yet *L. perparvus* (cf. fig. 2) which externally is very similar to the three-named has gonopods of an obviously different and more complex pattern. Elsewhere in the Diplopoda, differences of such a magnitude would be generally considered of an importance requiring generic rank.

On the other hand, Attems' precedent notwithstanding, I cannot see how anyone could place *L. laminata* in any species-group with the smaller and narrower species having typical *Lophodesmus* facies. The much greater size, broader paranota, mode of placement of the porosteles, absence of enlarged series DL, all point to a respectable level of structural differentiation.

These observations reflect the quandary imposed by ignorance of the male characters of *L. pusillus*. Although the ornamentation of the female agrees fairly well with that of Neotropical species, there is no reason whatever to think or assume that the gonopods will be similar. Although we know several instances of obviously congeneric species occurring in both the East Indies and in Central America (in *Spirobolellus*, for instance) it would not be justified to impose an analogy drawn from this situation on to the lophodesmoid forms. I venture the prediction that when male topotypes of *pusillus* have been obtained at Maumerie, Flores, good differences of generic value will be discovered. Still, it would be premature to suggest a new generic name for the American forms, when the definition and validity of the already proposed genera remains in overall uncertainty.

Genus Lophodesmus Pocock

Lophodesmus Pocock, 1894, In: Weber, *Zool. Ergeb. Reise Niederl. Ost-Ind.* vol. 3, p. 372. Type species, *Lophodesmus pusillus* Pocock, by monotypy.

In its present somewhat arbitrary sense, this genus contains species in which the four dorsal series of tubercules are distinct, composed of three tubercules each; the collum decalobed; the paranota laterally bilobed; porosteles on segments 5, 7, 9, 10, 12, 13, 15, and 16, pores opening on surface of paranota 17-19. Gonopod coxae greatly enlarged; telopodites reduced and simplified, not or only slightly projecting distad beyond coxal ends. Males, where known, with femora of third pair of legs enlarged, and sternum of fifth segment with an erect median projection of variable size and shape.

As noted elsewhere, it is unknown whether the Neotropical species currently placed in *Lophodesmus* are congeneric with the type species, but with one exception it seems desireable to leave them provisionally in this genus. I think that *L. laminatus* is sufficiently distinctive to justify its removal to the genus *Synoptura*, set up by Attems on an erroneous premise, but which must be retained to include *laminatus* which is the type species.

Lophodesmus celatus Pocock

Lophodesmus celatus Pocock, 1909, *Biologia centr.-am., Chilop. & Diplop.*, p. 133, pl. X, figs. 2, 2*a*.

I have seen the type series of this species, three females (B.M. 1894. 4.4.1.141-143, Volcan de Agua, Guatemala), and cannot improve upon Pocock's detailed original description.

Lophodesmus perparvus Pocock

Lophodesmus perparvus Pocock, 1909, *Biologia centr.-am., Chilop. & Diplop.*, p. 133, pl. X, figs. 3, 3*a*.—Loomis, 1968, *Bull. U.S. natn. Mus.*, No. 266, p. 50.

The type series of this species consists of one male and several females. In size, general appearance, and details of tuberculation *perparvus* is similar to *L. petrinus* (compare figs. 3 and 7).

The genitalia however show striking differences. The coxae have a different shape when seen in posterior view, and their outer convexity lacks any trace of pubescence. In medial aspect (fig. 2) the telopodite is totally unlike that of *petrinus*, being much more

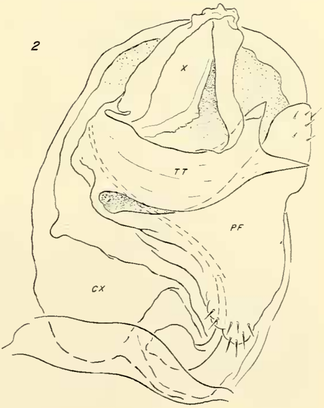


Fig. 2.

Lophodesmus perparvus Pocock.

Left gonopod of male syntype, mesal aspect. CX, coxa; PF, prefemur; TT, tibiotarsus; X, postfemoral structure of uncertain homology.

complex in structure. Near the midlength there is a large, abruptly reflexed, apically bifid branch running caudad to contact the prefemur, thence laterad; possibly this process is the tibiotarsus and is labeled TT on the drawing. Just distolaterad to the point of flexure is a large subconical hollow structure of unknown homology, indicated by the letter X, figure 2. In the single specimen at hand it was not possible to trace the prostatic groove to its termination.

Comparison of figures 2 and 12 shows differences of such magnitude that surely generic separation of the species involved seems warranted. Yet as long as only a few lophodesmids are known, we have no idea of the extent of generic variability, and especially since one of the Guatemalan groups may be congeneric with the type of *Lophodesmus*, no real purpose would be served by the proposal of what might well be a superfluous generic name for one of the groups.

Lophodesmus petrinus n. sp.

Diagnosis. — A Central American lophodesmid easily distinguished from other local species by the elongated, apically acuminate tibiotarsus of the gonopod (fig. 12, TT) with a conspicuous pubescent convexity at the base. Sternal process between 4th pair of legs triangular, sides diverging abruptly from a narrow base, apically flattened (fig. 9); coxae of 5th pair of legs approximate, sternum between them strongly narrowed, without paramedian tubercules.

Type material. — Male holotype, three male and three female paratypes (Muséum Genève) from Cueva Chirripeck, south of Coban at 1400 m., Dept. Alta Verapaz, Guatemala, April 6 & 8, 1973, Pierre Strinati legit.

Holotype. — Adult male, 7.0 mm in length, 1.50 mm in width. Dorsum superficially appearing black; with magnification the metaterga purplishbrown with a scattering of minute black dots; sides below paranota similar but paler; sterna, legs, and prozona whitish to nearly colorless.

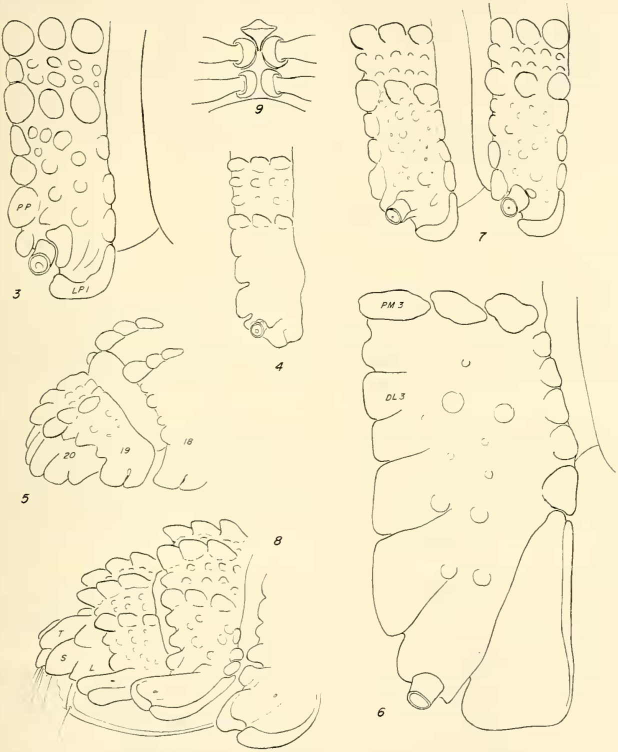
Head of the usual pyrgodesmid form, epicranial region elevated and granulorugose, nearly black, with a sharply defined curved ridge above the antennae on each side and a distinct median epicranial depression. Antennae distally clavate, 5th article as large as any other two combined; 7th small, conic, with four minute sensory cones.

Collum dorsally subhemispherical, sloping down abruptly to the nearly horizontal marginal lobes, with four enlarged tubercules on each side, placed roughly in pairs before the PM and DL series of 2nd segment, the remainder of the surface set with numerous irregular smaller tubercules.

Paranota of segment 2 considerably broadened laterally, the edge trilobed; anterior edge with three tubercules between DL 1 and LP 1, posterior edge with three tubercules between DL 3 and PP. Intercalary tubercules small but distinct, in four pairs, the last pair placed between DL 3 and PM 3.

Metaterga and paranota of segment 3 considerably shorter anteroposteriorly than those of 5th and following, tuberculation about as described for 2nd segment except paranota not expanded and the lateral edge bilobed, thickened margin of LP 1 extending mesad, Am 3 displaced from anterior corner. Segment 4 similar to 3 except that posteriormost pair of intercalaries replaced by a single large median tubercule between DL 3 and PM 3. Segment 5, including its paranota, longer, LP 3 replaced by the porostele. Segment 6 similar to 4 except that Cm 1 is not present, there being only two Cm tubercules. Segment 7 similar to 5, but with a small LP 3 tubercule visible between porostele and PP; 6 pairs of middorsals, those of the 5th pair set distinctly closer together than the others, the 6th pair on the caudal edge.

Midbody segments of the form shown in figure 7. Porosteles present on segments 5, 7, 9, 10, 12, 13, 15, and 16, pores opening on surface of paranota proximad to base of LP 3 on segments 17-19. On posterior segments PM tubercules enlarged and in contact with each other: DL tubercules relatively smaller and widely spaced; middorsals indistinct. PM 3 of segment 19 not projecting caudad over base of segment 20, latter completely exposed in dorsal aspect, with low tubercules apparently homologues to PM 2 and 3; apex deflexed ventral (fig. 8).



FIGS. 3 to 9.

External structures, *Lophodesmus* and *Synoptura.*

FIG. 3. *Lophodesmus perparvus* Pocock, right side of metatergum of segment 9, oblique dorsolateral aspect. — FIG. 4. *Lophodesmus pusillus* Pocock, right side of metatergum of segment 9, lateral aspect, from holotype. — FIG. 5. *L. pusillus*, posterior end of body, lateral aspect. — FIG. 6. *Synoptura laminata* (Pocock), right side of metatergum of segment 9, dorsolateral aspect, specimen from Palenque, Chiapas. — FIG. 7. *Lophodesmus petrinus*, n. sp. right side of segments 9 and 10, dorsolateral aspect. — FIG. 8. *L. petrinus*, last four body segments, dorsolateral aspect from right side. — FIG. 9. *L. petrinus*, ventral aspect of segment 5 showing bases of legs and median sternal process. All drawings made to same scale (X 90).

Femora of 3rd pair of legs somewhat thicker than on adjacent legs; sternal process of 5th segment triangular, expanding distally from a narrow base, apically truncate and flattened (fig. 9).

Gonopods of the form shown in figures 10-12. Coxae large, galeate, the lateral convexity with numerous microsetae, attached to each other by a long median commissure and with two large setae on the anterior side in front of the telopodite. Latter robust, the prefemoral region transverse and setose; prostatic groove concealed in mesal aspect; acropodite abbreviated, the tibiotarsus elongate-triangular, its basal region with three small lobes (a, b, s, of which the shortest is the solenomerite) and a large median pubescent lobe (fig. 10).

Etymology. — The species name is a Latinized form of the given name of the collector.

Distribution. — Dr. Shear, upon seeing gonopod drawings for this species, advised me that he has material of it from Cueva Agua Escondida, El Tobacal, Dept. Huehuetenango, Guatemala (M. Shawcross leg. December 1972). This locality is about 120 km west of Coban, and like it, in a region of fairly high elevation.

Lophodesmus pusillus Pocock

Lophodesmus pusillus Pocock, 1894, In: Weber. *Zool. Ergeb. Reise Niederl. Ost.-Ind.*, vol. 3, p. 373, pl. 22, fig. 12.

The female holotype (B.M. 1896.10.6.62) from Maumerie, Flores, has been examined. Owing to its small size and perhaps also to its sex, the tuberculation of the terga is considerably reduced and not easy to make out with certainty. Some differences from the Guatemalan species can be observed: the lack of distinct tubercules in the Am series, only two in the Cm series, and two intercalaries between DL 3 and PM 3 instead of only one.

In his 1914 key to pyrgodesmid genera, Attems placed *Lophodesmus* in the division "5b) Analsegment ganz vom 19. verdeckt" but based this statement on what he took to be the situation in his *Lophodesmus nanus* from New Britain. Actually *nanus* is not congeneric with *pusillus* (the paranota have three lateral lobes, for instance) and moreover, I think it is likely, judged from Attems' figure 37, what he thought was the "analsegment" of *nanus* was in fact just the tip of the epiproct and thus a part of the 19th segment.

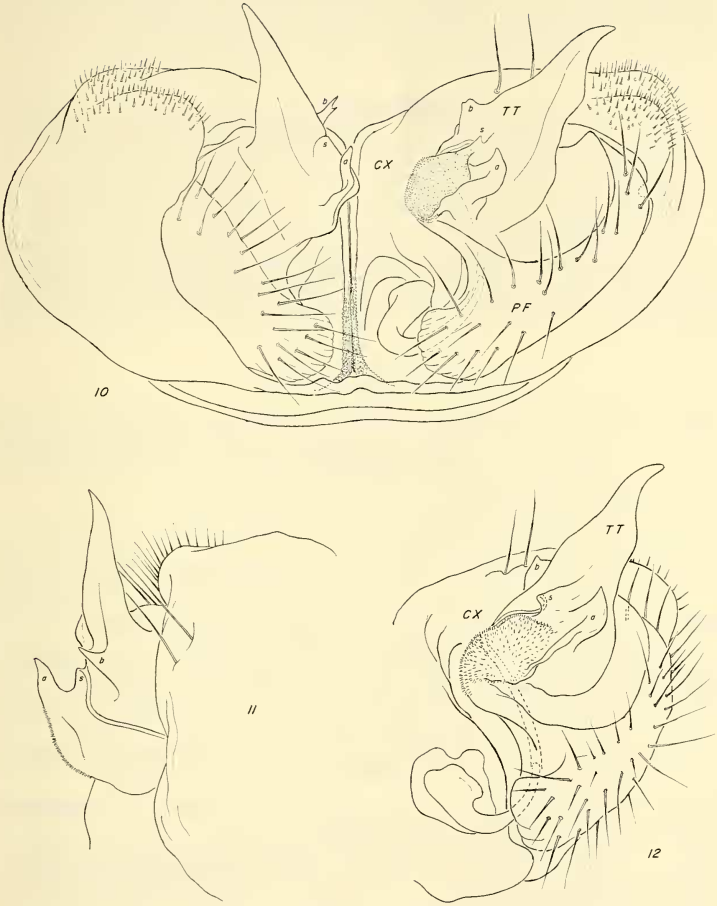
As clearly shown in figure 4, of this paper the 20th segment of *pusillus* is entirely exposed, and Attems' reason for proposing a new genus *Synoptura* for Pocock's three Central American lophodesmids was incorrect. However, that name can be maintained on the basis of other considerations, as noted in a later paragraph.

At it seems unlikely that the species described and figured by Carl (1902) as *pusillus* is conspecific with the type of that name, the nomenclature of these various species groups is going to remain unsettled until topotype males can be obtained from Flores. Or, unless the name *Lophodesmus* is arbitrarily restricted to its type species only, and new generic names proposed for distinctive species or species-groups now ranked under that name. This procedure would at least permit progress in the classification of the family.

Genus Synoptura Attems

Synoptura Attems, 1914, *Arch. Naturgesch.*, vol. 80, A 4, p. 174. Type species, *Lophodesmus laminatus* Pocock, 1909, by original designation.

In my view the overall facies of *L. laminatus* differs sufficiently from the appearance of the several other Neotropical lophodesmids to warrant its formal nomenclatorial



FIGS. 10 to 12.

Lophodesmus petrinus, n. sp.

FIG. 10. Gonopods viewed *in situ* (posterior, ventral, aboral). — FIG. 11. Left gonopod, lateral aspect. — FIG. 12. Left gonopod, mesal aspect. All drawings to same scale (X 430) from the same specimen (paratype). CX, coxa; TT, tibiotarsus; a, b, rudimentary postfemoral processes; s, solenomerite.

recognition. In body size, and in the form and structure of the paranota (compare figs. 3 and 6), *laminatus* is clearly a disjunct form for which the name *Synoptura* may be restricted, but defined in a different way from the original diagnosis and from the sense of Attems in 1940 who included in it also *L. perparvus* and *L. celatus*.

Synoptura laminata (Pocock)

Lophodesmus laminatus Pocock, 1909, *Biologia centr.-am., Chilop. & Diplop.*, p. 132, pl. X, figs. 1-1*g*.

Synoptura laminata: Attems, 1914, *Arch. Naturgesch.*, vol. 80, A 4, p. 179; 1940, *Tierreich*, lief. 70, p. 308.

Pocock's types were from Teapa, Tabasco. My concept of the species is drawn from a male (the gonopods unfortunately removed and lost) taken at the Palenque Ruins, Chiapas, June 25, 1950 (C. & M. Goodnight leg.) This locality is only about 100 km from Teapa, and the specimen agrees closely with Pocock's original description and figures.

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